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BEACH CITY RESERVOIR, STARK, AND TUSCARAWAS COUNTIES, OHIO

PACIFIC NORTHWEST ENVIRONMENTAL
RESEARCH LABORATORY

PREPARED FOR
NATIONAL ENVIRONMENTAL RESEARCH CENTER

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NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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Report

on

Beach City Reservoir

Stark and Tuscarawas Counties

Ohio

EPA Region V

Working Paper No. 394

With the cooperation of the

Ohio Environmental Protection Agency

and the

Ohio National Guard

June, 1975

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Ohio Environmental Protection Agency for professional involvement, to the Ohio National Guard for conducting the tributary sampling phase of the Survey, and to those Ohio wastewater treatment plant operators who provided effluent samples and flow data.

Ned Williams, Director, and Tom Birch, Ken Carr, Larry Dietrick, Ron Havlice, Larry Korecko, Rod Mehlhop, Terry Wheeler, and John Youger, Ohio Environmental Protection Agency, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

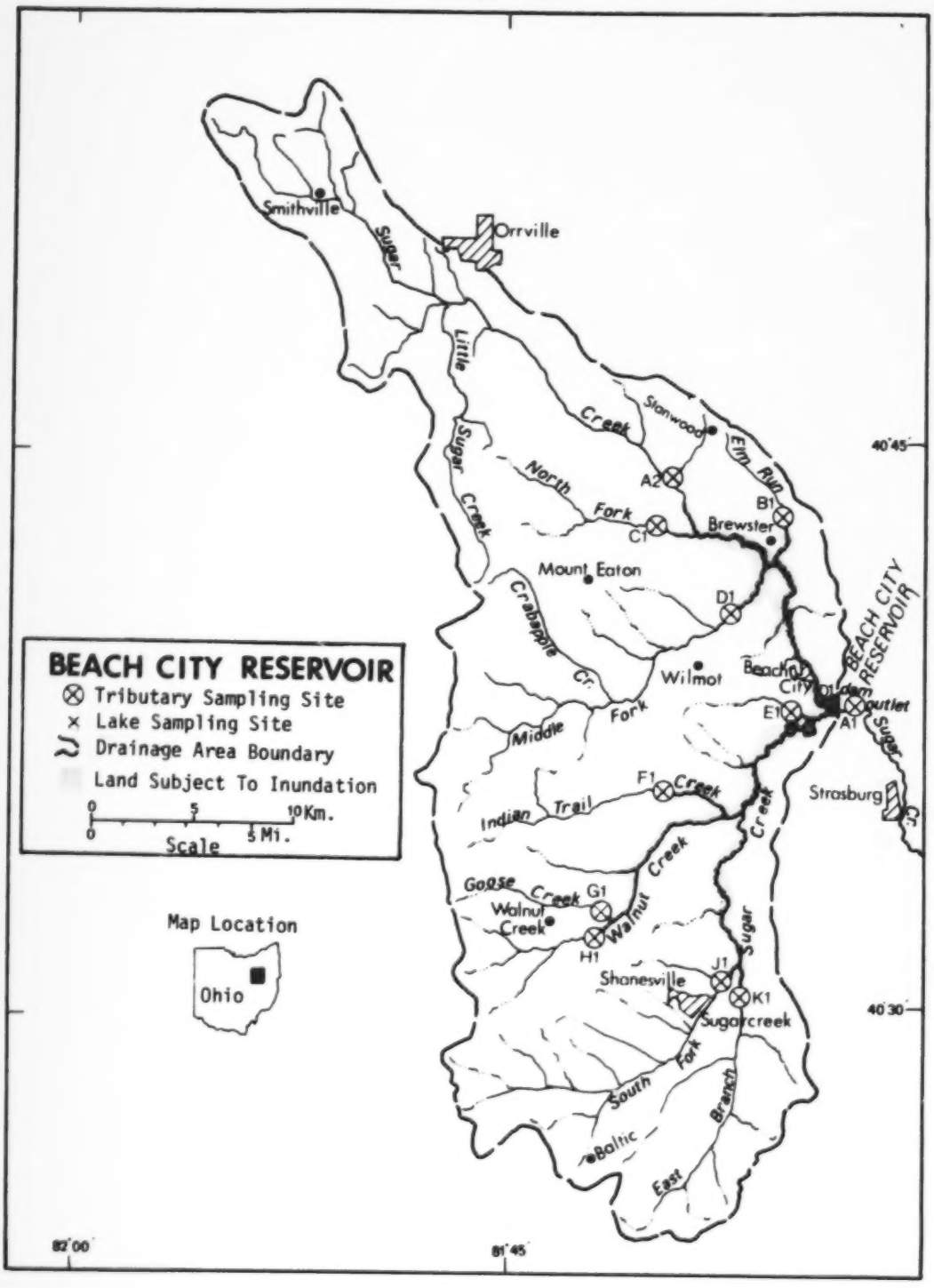
Major General Dana L. Stewart, then the Adjutant General of Ohio, and Project Officer Lt. Colonel Robert C. Timmons, who directed the volunteer efforts of the Ohio National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF OHIO

LAKE NAME	COUNTY
Atwood	Carroll, Tuscarawas
Beach City	Stark, Tuscarawas
Berlin	Mahoning, Portage, Stark
Buckeye	Fairfield, Licking, Perry
Charles Mill	Ashland, Richland
Deer Creek	Fayette, Pickaway
Delaware	Delaware
Dillon	Muskingum
Grand Lake of St. Marys	Auglaize, Mercer
Grant	Brown
Holiday	Huron
Hoover	Delaware, Franklin
Indian	Logan
Loramie	Auglaize, Shelby
Mosquito Creek	Trumbull
O'Shaughnessy	Delaware
Pymatuning	Ashtabula, OH; Crawford, PA
Pleasant Hill	Ashland, Richland
Rocky Fork	Highland
Shawnee	Greene
Tappan	Harrison


BEACH CITY RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Drainage Area Boundary
Land Subject To Inundation
0 5 10 Km.
0 5 Mi.
Scale
Map Location
Ohio
Smithville
Orrville
Little Sugar Creek
Stanwood
Elm Run
North Fork
Brewster
Mount Eaton
Crabapple Cr.
Wilmot
Beach City
Dam
Outlet
Middle Fork
Indian Trail
Creek
Strasburg
Goose Creek
Walnut Creek
Shanesville
Sugarcreek
South Fork
Baltic
East Branch
Sugar Creek
A1
A2
B1
C1
D1
E1
F1
G1
H1
J1
K1
40°45'
40°30'
82°00'
81°45'

BEACH CITY RESERVOIR

STORET NO. 3901

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Beach City Reservoir is eutrophic. It ranked tenth in overall trophic quality when the 20 Ohio lakes sampled in 1973 were compared using a combination of six parameters*. Twelve of the lakes had less median total phosphorus, 11 had less median dissolved phosphorus, 15 had less median inorganic nitrogen, three had less mean chlorophyll a, and 17 had greater mean Secchi disc transparency. Dissolved oxygen in the July near-surface sample was only 43% of saturation.

The Survey limnologists reported extensive stands of rooted submergent and emergent aquatic plants along the shoreline.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Beach City Reservoir was phosphorus limited when the sample was collected (07/30/73). The lake data indicate phosphorus limitation at all sampling times.

C. Nutrient Controllability:

1. Point sources--The phosphorus contribution of the listed point sources amounted to about 10% of the load reaching Beach City Reservoir during the sampling year. The wastewater treat-

* See Appendix A.

ment plants at Brewster and Smithville were estimated to have contributed 5.0% and 3.7% of this total, respectively. Septic tanks serving Beach City, lakeshore dwellings, campsites, and parks were estimated to have contributed 1.2%.

Fifteen industrial point sources, many of which are of probable nutrient significance, discharge to Sugar Creek, North Fork, Middle Fork, South Fork, and East Branch (see page 10). No information is available on the nutrient contributions of these sources; however, the loads are included in those measured at stations A-2, C-1, D-1, J-1, and K-1, respectively. In addition, the community of Sugar Creek was served by septic tanks during the Survey sampling year but is now served by a wastewater treatment plant which discharges into Sugar Creek (see pages 9-10). A more-detailed study is needed to determine the nutrient impact of all of these sources.

The present phosphorus loading of 27.15 $g/m^2/yr$ is 12 times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 14). Although Vollenweider's model may not be applicable to lakes with short hydraulic retention times, the existing trophic condition of the reservoir is evidence of excessive nutrient loads. Because this water body is phosphorus limited, all phosphorus inputs to Beach City Reservoir should be minimized to the greatest practicable extent to at least slow the present rate of eutrophication.

2. Non-point sources--About 90% of the total annual phosphorus input to Beach City Reservoir is attributed to non-point sources. The South Fork of Sugar Creek contributed 29.7%; Sugar Creek, 23.0%; the East Branch of Sugar Creek, 9.5%; the Middle Fork of Sugar Creek, 9.1%; and the six remaining gaged tributaries collectively contributed 11.5% of the total phosphorus input. Ungaged tributaries were estimated to have contributed 7.3% of the total load.

The phosphorus export rates of Sugar Creek (59 $kg/km^2/yr$), North Fork (51 $kg/km^2/yr$), South Fork (153 $kg/km^2/yr$), and East Branch (62 $kg/km^2/yr$) are quite high in comparison to the other sampled tributaries in this drainage basin (see page 13) and the tributaries of neighboring water-bodies. For example, the mean of the phosphorus export rates of Pleasant Hill Reservoir* tributaries was 11 $kg/km^2/yr$ (range of 5 to 16 $kg/km^2/yr$); the mean of the phosphorus export rates of Berlin Reservoir* tributaries was 26 $kg/km^2/yr$ (range of 14 to 53 $kg/km^2/yr$); and the mean of the phosphorus export rates of the unimpacted tributaries of Atwood Reservoir* was 10 $kg/km^2/yr$ (range of 9 to 12 $kg/km^2/yr$). The high export rates indicate that phosphorus loads from unsampled point sources probably contribute significantly to the total load to Beach City Reservoir.

* Working Paper No. 408, No. 395, and No. 393, respectively.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 1.70 kilometers^2.
2. Mean depth: 1.2 meters.
3. Maximum depth: 3.0 meters.
4. Volume: 2.040 x 10^6 m^3.
5. Mean hydraulic retention time: 3 days (based on outlet flow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Sugar Creek	180.8	1.8
Elm Run	11.4	0.1
North Fk., Sugar Creek	44.5	0.4
Middle Fk., Sugar Creek	114.0	1.1
Unnamed Stream (E-1)	10.6	0.1
Indian Trail Creek	35.0	0.4
Goose Creek	15.8	0.2
Walnut Creek	34.4	0.3
South Fk., Sugar Creek	89.9	0.9
East Branch, Sugar Creek	70.7	0.7
Minor tributaries & immediate drainage -	168.2	1.6
Totals	775.3	7.6

2. Outlet -

Sugar Creek	777.0**	7.2

C. Precipitation***:

1. Year of sampling: 106.3 centimeters.
2. Mean annual: 97.8 centimeters.

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† Table of metric equivalents--Appendix B.
†† Youger, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Beach City Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from one or more depths at one station on the lake (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration; and a similar sample was collected for chlorophyll *a* analysis. During the second visit, an 18.9-liter depth-integrated sample was collected for algal assays. The maximum depth sampled was 1.8 meters.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR BEACH CITY RESERVOIR
STORET CODE 3901

PARAMETER	1ST SAMPLING (4/20/73) 1 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/30/73) 1 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/ 6/73) 1 SITES RANGE	MEAN	MEDIAN
TEMP (C)	15.4 - 15.8	15.6	15.6	24.2 - 24.2	24.2	24.2	17.5 - 17.7	17.6	17.6
DISS OXY (MG/L)	7.5 - 7.5	7.5	7.5	3.4 - 3.4	3.4	3.4	5.0 - 5.0	5.0	5.0
CNDCTVY (MCROMO)	470. - 470.	470.	470.	439. - 439.	439.	439.	748. - 790.	769.	769.
PH (STAND UNITS)	8.2 - 8.2	8.2	8.2	7.4 - 7.4	7.4	7.4	7.0 - 7.2	7.1	7.1
TOT ALK (MG/L)	36. - 40.	38.	38.	102. - 102.	102.	102.	72. - 78.	75.	75.
TOT P (MG/L)	0.085 - 0.093	0.089	0.089	0.281 - 0.281	0.281	0.281	0.122 - 0.142	0.132	0.132
ORTHO P (MG/L)	0.009 - 0.017	0.013	0.013	0.033 - 0.033	0.033	0.033	0.012 - 0.015	0.013	0.013
NO2+NO3 (MG/L)	2.700 - 2.800	2.750	2.750	1.610 - 1.610	1.610	1.610	0.940 - 0.980	0.960	0.960
AMMONIA (MG/L)	0.120 - 0.160	0.140	0.140	0.380 - 0.380	0.380	0.380	0.360 - 0.400	0.380	0.380
KJEL N (MG/L)	0.400 - 0.800	0.600	0.600	1.300 - 1.300	1.300	1.300	1.300 - 1.600	1.450	1.450
INORG N (MG/L)	2.820 - 2.960	2.890	2.890	1.990 - 1.990	1.990	1.990	1.340 - 1.340	1.340	1.340
TOTAL N (MG/L)	3.100 - 3.600	3.350	3.350	2.910 - 2.910	2.910	2.910	2.240 - 2.580	2.410	2.410
CHLRPYL A (UG/L)	4.3 - 4.3	4.3	4.3	19.4 - 19.4	19.4	19.4	8.9 - 8.9	8.9	8.9
SECCHI (METERS)	0.3 - 0.3	0.3	0.3	0.2 - 0.2	0.2	0.2	0.3 - 0.3	0.3	0.3

B. Biological characteristics:

1. Phytoplankton* -

Sampling Date	Dominant Genera	Algal Units per ml
04/20/73	1. Synedra sp.	203
	2. Navicula sp.	65
	3. Dinobryon sp.	63
	4. Cryptomonas sp.	38
	5. Ankistrodesmus sp.	28
	Other genera	138
	Total	535
10/06/73	1. Synura sp.	124
	2. Nitzschia sp.	124
	3. Scenedesmus sp.	100
	4. Oscillatoria sp.	74
	5. Cyclotella sp.	74
	Other genera	521
	Total	1,017

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
04/20/73	01	4.3
07/30/73	01	19.4
10/06/73	01	8.9

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.020	0.762	12.8
0.050 P	0.070	0.762	25.2
0.050 P + 1.0 N	0.070	1.762	27.9
1.0 N	0.020	1.762	13.6

* The July phytoplankton sample was lost in shipment.

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Beach City Reservoir was high at the time the sample was collected (07/30/73). The addition of orthophosphorus alone produced a significant increase in yield over that of the control, which shows the sample was phosphorus limited at that time. Note that the addition of only nitrogen resulted in a yield which was not significantly greater than that of the control.

The lake data also indicate phosphorus limitation (the mean inorganic nitrogen/orthophosphorus ratios were 30/1 or greater at all sampling times).

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Ohio National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of March when three samples were collected. Sampling was begun in May, 1973, and was completed in April, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Ohio District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1, E-1, F-1, and G-1 and multiplying the means by the ZZ area in km^2.

The communities of Brewster and Smithville did not participate in the Survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year. The town of Sugar Creek also did not participate. However, during the sampling year this community was served by septic tanks (Ness,

* See Working Paper No. 175.

1975), and nutrient loads from this source probably were negligible considering the distance from the lake.

Nutrient loads from two additional communities - Claycroft Mobile Park and Eastwood Sewer Service Area - which probably are relatively insignificant, were not included in the loadings since information on these sources is not available.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)††	Receiving Water
Sugar Creek†	2,000	ext. aer. & micro-strainer	609.6	South Fk., Sugar Creek
Brewster*	2,020	trickling filter	764.6	Beach City Res.
Smithville**	1,500	ext. aer.	567.8	Sugar Creek

2. Known industrial*** - At least 15 industries dishcarge to the Beach City Reservoir drainage basin, many of which are of probable nutrient significance. Farmerstown Cheese Co., Baltic Rubber and Plastics, Union Cheese Co., and Belden Brick Co. (2 plants) impact the South Fork of Sugar Creek. Holmes By-Products, Troyers Trail Bologna, and a poultry processing plant impact Indian Trail Creek. Norton Co., Swift Chemical Co., Norfolk and Western Railroad, and Wilmot Mining Co. impact Sugar Creek. Alpine Cheese Factory, Kidran Cheese Factory, and Ragersville Dairy impact the Middle Fork, North Fork, and East Branch of the Sugar River, respectively. Because data on the discharges are not available, these sources are not listed on the following loading pages; however, their nutrient loads, if any, are included in the respective tributary loads.

† Plant in operation as of May, 1974 (Hess, 1975).
†† Estimated at 0.3785 m^3/capita/day.
* Anonymous, 1971 (population is 1970 Census).
** Carpenter, 1975.
*** Youger, 1975.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Sugar Creek	10,595	23.0
Elm Run	145	0.3
North Fk., Sugar Creek	2,265	4.9
Middle Fk., Sugar Creek	4,215	9.1
Unnamed Stream (E-1)	105	0.2
Indian Trail Creek	1,090	2.4
Goose Creek	410	0.9
Walnut Creek	1,275	2.8
South Fk., Sugar Creek	13,715	29.7
East Branch, Sugar Creek	4,395	9.5
b. Minor tributaries & immediate drainage (non-point load) -	3,365	7.3
c. Known municipal STP's -		
Smithville	1,700	3.7
Brewster	2,290	5.0
d. Septic tanks* -	560	1.2
e. Industrial - Unknown	?	-
f. Direct precipitation** -	30	<0.1
Total	46,155	100.0

2. Outputs -

Lake outlet - Sugar Creek	38,480

3. Net annual P accumulation - 7,675 kg.

* Estimate based on Beach City (pop. 1,133), 132 lakeshore dwellings, three parks, and two camps; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Sugar Creek	228,345	26.5
Elm Run	9,895	1.1
North Fk., Sugar Creek	38,965	4.5
Middle Fk., Sugar Creek	97,335	11.3
Unnamed Stream (E-1)	7,115	0.8
Indian Trail Creek	31,375	3.7
Goose Creek	19,435	2.3
Walnut Creek	35,910	4.2
South Fk., Sugar Creek	124,725	14.5
East Branch, Sugar Creek	79,315	9.2
b. Minor tributaries & immediate drainage (non-point load) -	154,115	17.9
c. Known municipal STP's -		
Smithville	5,100	0.6
Brewster	6,870	0.8
d. Septic tanks* -	20,970	2.4
e. Industrial - Unknown	?	-
f. Direct precipitation** -	1,835	0.2
Total	861,305	100.0

2. Outputs -

Lake outlet - Sugar Creek 758,765

3. Net annual N accumulation - 102,540 kg.

* Estimate based on Beach City (pop. 1,133), 132 lakeshore dwellings, three parks, and two camps; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Sugar Creek	59	1,263
Elm Run	13	868
North Fk., Sugar Creek	51	876
Middle Fk., Sugar Creek	37	854
Unnamed Stream (E-1)	10	671
Indian Trail Creek	31	896
Goose Creek	26	1,230
Walnut Creek	37	1,044
South Fk., Sugar Creek	153	1,387
East Branch, Sugar Creek	62	1,122

E. Yearly Loadings:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	27.15	4.51	506.7	60.3

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Beach City Reservoir:

"Dangerous" (eutrophic loading)	2.20
"Permissible" (oligotrophic loading)	1.10

V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. OWP-1, vol. 5, Washington, DC.

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3901	BEACH CITY RESERVOIR	0.122	1.490	489.000	10.867	11.600	0.015
3902	BUCKEYE LAKE	0.179	0.380	490.000	186.567	9.600	0.020
3905	CHARLES MILL RESERVOIR	0.127	0.465	482.555	67.144	15.000	0.011
3906	DEER CREEK RESERVOIR	0.098	2.980	470.125	9.887	13.900	0.036
3907	DELAWARE RESERVOIR	0.086	2.340	484.111	10.856	14.500	0.024
3908	DILLION RESERVOIR	0.163	1.590	481.250	27.400	14.300	0.037
3912	GRANT LAKE	0.113	0.570	486.333	40.533	12.200	0.019
3914	HOOVER RESERVOIR	0.040	1.640	462.750	13.017	14.800	0.008
3915	INDIAN LAKE	0.120	0.380	485.222	76.855	14.200	0.012
3917	LORAMIE LAKE	0.185	1.380	494.000	104.100	8.200	0.019
3921	MOSQUITO CREEK RESERVOIR	0.058	0.150	465.333	36.267	11.600	0.006
3924	PLEASANT HILL LAKE	0.036	0.455	456.833	22.850	14.700	0.010
3927	LAKE SAINT MARYS	0.148	0.200	484.167	79.150	8.200	0.014
3928	ATWOOD RESERVOIR	0.031	0.205	462.000	16.442	14.700	0.005
3929	HERLIN RESERVOIR	0.042	0.900	465.435	15.496	13.600	0.006
3930	HOLIDAY LAKE	0.125	0.575	465.333	55.350	15.000	0.034
3931	O'SHAUGNESSY RESERVOIR	0.203	3.070	479.333	5.522	14.900	0.159
3932	ROCKY FORK LAKE	0.067	0.790	473.000	38.022	15.000	0.010
3933	SHAWNEE LAKE	0.069	2.380	474.333	39.567	15.000	0.009
3934	TAPPAN LAKE	0.043	0.280	466.111	37.711	15.000	0.007

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	SOU- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P	INDEX NO
3901	BEACH CITY RESERVOIR	37 (7)	21 (4)	11 (2)	84 (16)	82 (15)	42 (8)	277
3902	BUCKEYE LAKE	11 (2)	76 (14)	5 (1)	0 (0)	89 (17)	26 (5)	207
3905	CHARLES MILL RESERVOIR	26 (5)	63 (12)	37 (7)	21 (4)	11 (0)	58 (11)	216
3906	DEER CREEK RESERVOIR	53 (10)	5 (1)	63 (12)	95 (18)	63 (12)	11 (2)	290
3907	DELAWARE RESERVOIR	58 (11)	16 (3)	32 (6)	89 (17)	47 (9)	21 (4)	263
3908	DILLION RESERVOIR	16 (3)	32 (6)	42 (8)	58 (11)	53 (10)	5 (1)	206
3912	GRANT LAKE	47 (9)	58 (11)	16 (3)	32 (6)	74 (14)	34 (6)	261
3914	HOOVER RESERVOIR	87 (16)	26 (5)	89 (17)	79 (15)	32 (6)	79 (15)	392
3915	INDIAN LAKE	42 (8)	76 (14)	21 (4)	16 (3)	58 (11)	53 (10)	266
3917	LORAMIE LAKE	5 (1)	37 (7)	0 (0)	5 (1)	97 (18)	34 (6)	178
3921	MOSQUITO CREEK RESERVOIR	74 (14)	100 (19)	82 (15)	53 (10)	82 (15)	92 (17)	483
3924	PLEASANT HILL LAKE	95 (18)	68 (13)	100 (19)	63 (12)	39 (7)	66 (12)	431
3927	LAKE SAINT MARYS	21 (4)	95 (18)	26 (5)	11 (2)	97 (18)	47 (9)	297
3928	ATWOOD RESERVOIR	100 (19)	89 (17)	95 (18)	68 (13)	39 (7)	100 (19)	491
3929	BERLIN RESERVOIR	79 (15)	42 (8)	74 (14)	74 (14)	68 (13)	92 (17)	429
3930	HOLIDAY LAKE	32 (6)	53 (10)	82 (15)	26 (5)	11 (0)	16 (3)	220
3931	O'SHAUGNESSY RESERVOIR	0 (0)	0 (0)	47 (9)	100 (19)	26 (5)	0 (0)	173
3932	ROCKY FORK LAKE	68 (13)	47 (9)	58 (11)	42 (8)	11 (0)	66 (12)	292
3933	SHAWNEE LAKE	63 (12)	11 (2)	53 (10)	37 (7)	11 (0)	74 (14)	249
3934	TAPPAN LAKE	87 (16)	84 (16)	68 (13)	47 (9)	11 (0)	84 (16)	381

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	3928	ATWOOD RESERVOIR	491
2	3921	MOSQUITO CREEK RESERVOIR	483
3	3924	PLEASANT HILL LAKE	431
4	3929	BERLIN RESERVOIR	429
5	3914	HOOVER RESERVOIR	392
6	3934	TAPPAN LAKE	381
7	3927	LAKE SAINT MARYS	297
8	3932	ROCKY FORK LAKE	292
9	3906	DEER CREEK RESERVOIR	290
10	3901	BEACH CITY RESERVOIR	277
11	3915	INDIAN LAKE	266
12	3907	DELAWARE RESERVOIR	263
13	3912	GRANT LAKE	261
14	3933	SHAWNEE LAKE	249
15	3930	HOLIDAY LAKE	220
16	3905	CHARLES MILL RESERVOIR	216
17	3902	BUCKEYE LAKE	207
18	3908	DILLION RESERVOIR	206
19	3917	LORAMIE LAKE	178
20	3931	O'SHAUGNESSY RESERVOIR	173

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR OHIO 1/27/75

LAKE CODE 3901 BEACH CITY RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 777.0

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3901A1	777.0	10.02	14.27	17.68	12.57	8.95	6.03	4.93	2.01	1.10	1.56	2.58	5.80	7.20
3901A2	180.8	2.80	3.23	4.28	3.45	2.04	1.25	0.76	0.45	0.34	0.37	0.79	1.59	1.77
3901B1	11.4	0.17	0.22	0.28	0.24	0.14	0.07	0.05	0.02	0.02	0.02	0.04	0.10	0.11
3901C1	44.5	0.68	0.79	1.08	0.88	0.51	0.28	0.18	0.10	0.07	0.08	0.18	0.40	0.43
3901D1	114.0	1.76	2.07	2.61	2.10	1.30	0.76	0.48	0.27	0.20	0.22	0.48	0.99	1.10
3901E1	10.6	0.16	0.20	0.27	0.22	0.13	0.07	0.04	0.02	0.02	0.02	0.04	0.09	0.11
3901F1	35.0	0.54	0.65	0.88	0.71	0.40	0.23	0.14	0.08	0.06	0.06	0.14	0.31	0.35
3901G1	15.8	0.24	0.28	0.40	0.34	0.19	0.10	0.07	0.03	0.02	0.03	0.06	0.14	0.16
3901H1	34.4	0.51	0.62	0.85	0.68	0.40	0.22	0.14	0.08	0.06	0.06	0.14	0.28	0.34
3901J1	89.9	1.42	1.67	2.18	1.76	1.02	0.59	0.37	0.23	0.16	0.17	0.40	0.82	0.89
3901K1	70.7	1.16	1.36	1.73	1.39	0.82	0.48	0.28	0.18	0.13	0.13	0.28	0.65	0.71
3901ZZ	169.9	2.61	3.03	4.08	3.28	1.93	1.16	0.59	0.42	0.31	0.34	0.74	1.27	1.64

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 777.0
SUM OF SUB-DRAINAGE AREAS = 777.0

TOTAL FLOW IN = 91.73
TOTAL FLOW OUT = 86.90

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3901A1	5	73	13.42	6	8.44				
	6	73	7.31	10	6.31				
	7	73	3.43	15	2.10				
	8	73	2.04	19	2.27				
	9	73	1.27	16	0.93				
	10	73	3.11	21	1.47				
	11	73	9.29	11	1.98				
	12	73	11.24	2	22.85				
	1	74	19.45	6	6.09				
	2	74	8.10	17	5.47				
	3	74	17.95	3	14.58	10	34.26	31	47.57
	4	74	20.84	21	5.69				
3901A2	5	73	2.97	6	1.44				
	6	73	1.93	10	1.25				
	7	73	0.96	15	0.48				
	8	73	0.59	19	0.48				
	9	73	0.40	16	0.20				
	10	73	0.91	21	0.34				
	11	73	2.58	11	0.54				
	12	73	2.44	2	2.55				
	1	74	6.09	6	1.56				
	2	74	1.76	17	1.19				
	3	74	5.24	3	3.45	16	14.33	31	16.99
	4	74	5.47	21	1.36				

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TRIBUTARY FLOW INFORMATION FOR OHIO 1/27/75

LAKE CODE 3901 HEACH CITY RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3901B1	5	73	0.20	6	0.09				
	6	73	0.11	10	0.08				
	7	73	0.06	15	0.03				
	8	73	0.03	19	0.03				
	9	73	0.02	16	0.01				
	10	73	0.05	21	0.02				
	11	73	0.14	11	0.03				
	12	73	0.15	2	0.15				
	1	74	0.37	6	0.10				
	2	74	0.11	17	0.07				
	3	74	0.34	3	0.22	10	0.91	31	1.08
	4	74	0.37	21	0.08				
3901C1	5	73	0.74	6	.37				
	6	73	0.45	10	0.31				
	7	73	0.23	15	0.12				
	8	73	0.13	19	0.12				
	9	73	0.08	16	0.07				
	10	73	0.20	21	0.10				
	11	73	0.59	11	0.13				
	12	73	0.59	2	0.62				
	1	74	1.47	6	0.40				
	2	74	0.42	17	0.28				
	3	74	1.30	3	0.85	10	3.54	31	4.16
	4	74	1.39	21	0.34				
3901D1	5	73	1.90	6	0.91				
	6	73	1.19	10	0.79				
	7	73	0.59	15	0.31				
	8	73	0.34	19	0.31				
	9	73	0.24	16	0.19				
	10	73	0.54	21	0.31				
	11	73	1.56	11	0.34				
	12	73	1.53	2	1.59				
	1	74	3.82	6	0.99				
	2	74	1.13	17	0.74				
	3	74	3.17	3	2.18	10	9.03	31	10.68
	4	74	3.31	21	0.85				
3901E1	5	73	0.20	6	0.12				
	6	73	0.08	10	0.08				
	7	73	0.04	15	0.02				
	8	73	0.02	19	0.03				
	9	73	0.01	16	0.02				
	10	73	0.03	21	0.03				
	11	73	0.14	11	0.01				
	12	73	0.11	2	0.11				
	1	74	0.16	6	0.09				
	2	74	0.12	17	0.07				
	3	74	0.26	3	0.17	10	0.45	31	1.10
	4	74	0.18	21	0.06				

TRIBUTARY FLOW INFORMATION FOR OHIO 1/27/75

LAKE CODE 3901 MEACH CITY RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3901F1	5	73	0.62	6	0.40				
	6	73	0.27	10	0.27				
	7	73	0.13	15	0.07				
	8	73	0.06	19	0.09				
	9	73	0.04	16	0.03				
	10	73	0.11	21	0.05				
	11	73	0.51	11	0.05				
	12	73	0.37	2	0.40				
	1	74	0.54	6	0.28				
	2	74	0.40	17	0.24				
	3	74	0.82	3	0.57	10	1.50	31	3.60
	4	74	0.57	21	0.20				
3901G1	5	73	0.28	6	0.18				
	6	73	0.12	10	0.12				
	7	73	0.06	15	0.03				
	8	73	0.03	19	0.04				
	9	73	0.02	16	0.01				
	10	73	0.05	21	0.01				
	11	73	0.23	11	0.02				
	12	73	0.16	2	0.17				
	1	74	0.24	6	0.13				
	2	74	0.17	17	0.11				
	3	74	0.37	3	0.25	10	0.68	31	1.61
	4	74	0.27	21	0.09				
3901H1	5	73	0.62	6	0.40				
	6	73	0.26	10	0.27				
	7	73	0.13	15	0.07				
	8	73	0.06	19	0.09				
	9	73	0.04	16	0.02				
	10	73	0.11	21	0.03				
	11	73	0.48	11	0.05				
	12	73	0.34	2	0.34				
	1	74	0.51	6	0.28				
	2	74	0.37	17	0.23				
	3	74	0.79	3	0.54	10	1.47	31	3.54
	4	74	0.54	21	0.19				
3901J1	5	73	1.59	6	1.02				
	6	73	0.71	10	0.71				
	7	73	0.34	15	0.18				
	8	73	0.18	19	0.24				
	9	73	0.11	16	0.07				
	10	73	0.31	21	0.12				
	11	73	1.44	11	0.12				
	12	73	0.99	2	1.02				
	1	74	1.42	6	0.76				
	2	74	0.99	17	0.59				
	3	74	2.04	3	1.44	10	3.88	31	9.26
	4	74	1.42	21	0.51				

TRIBUTARY FLOW INFORMATION FOR OHIO 1/27/75

LAKE CODE 3901 BEACH CITY RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3901K1	5	73	1.27	6	0.79				
	6	73	0.57	10	0.57				
	7	73	0.26	15	0.14				
	8	73	0.14	19	0.19				
	9	73	0.09	16	0.13				
	10	73	0.24	21	0.21				
	11	73	1.02	11	0.10				
	12	73	0.76	2	0.79				
	1	74	1.16	6	0.59				
	2	74	0.79	17	0.48				
	3	74	1.61	3	1.13	10	3.03	31	7.28
	4	74	1.10	21	0.40				
3901ZZ	5	73	2.97						
	6	73	1.47						
	7	73	0.76						
	8	73	0.40						
	9	73	0.25						
	10	73	0.65						
	11	73	2.49						
	12	73	1.98	2	0.0				
	1	74	3.71						
	2	74	1.76						
	3	74	4.33						
	4	74	3.68						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/01/27

390101
40 38 08.0 081 33 36.0
BEACH CITY RESERVOIR
39157 OHIO

11EPALES
3

2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/20	15 00	0000	15.8		12	470	8.20	36	0.160	0.800	2.800	0.009
	15 00	0006	15.4	7.5		470	8.20	40	0.120	0.400	2.700	0.017
73/07/30	16 50	0000	24.2	3.4	8	439	7.40	102	0.380	1.300	1.610	0.033
73/10/06	13 15	0000	17.7		13	748	7.20	78	0.360	1.600	0.980	0.015
	13 15	0004	17.5	5.0		790	7.00	72	0.400	1.300	0.940	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/20	15 00	0000	0.093	4.3
	15 00	0006	0.085	
73/07/30	16 50	0000	0.281	19.4
73/10/06	13 15	0000	0.142	8.9
	13 15	0004	0.122	

APPENDIX E

TRIBUTARY DATA

STORET RETRIEVAL DATE 75/02/03

3901A1
40 38 14.0 081 32 50.0
SUGAR CREEK
39059 7.5 NAVARRE
O/BEACH CITY RESERVOIR
ST RT 21 BRDG 2 MI SE OF BEACH CITY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	10 45		2.100	1.450	0.189	0.019	0.075
73/06/10	09 50		1.960	0.910	0.154	0.024	0.120
73/07/15	09 35		0.770	1.540	0.273	0.014	0.090
73/08/19	09 55		0.820	1.600	0.315	0.019	0.153
73/09/16	10 00		0.220	1.300	0.078	0.019	0.180
73/10/21	10 25		0.910	1.400	0.173	0.034	0.290
73/11/11	10 30		1.300	0.950	0.200	0.012	0.055
73/12/02	09 30		3.780	0.500	0.088	0.024	0.095
74/01/06	10 15		3.200	0.800	0.128	0.056	0.150
74/02/17	10 25		2.940	1.200	0.315	0.060	0.275
74/03/03	10 35		3.300	0.800	0.090	0.030	0.150
74/03/10			2.800	2.100	0.092	0.047	0.440
74/03/31	09 40		2.600	1.400	0.115	0.045	0.200
74/04/21	08 45		1.800	0.900	0.140	0.015	0.090

STORET RETRIEVAL DATE 75/02/03

3901A2
40 44 12.0 081 39 12.0
SUGAR CREEK
39 7.5 WILMOT
I/BEACH CITY RESERVOIR
2NDRY RD BRDG 1 MI NE OF WEST LEBANON
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	09 35		3.200	1.320	0.075	0.052	0.105
73/06/10	09 05		3.500	1.050	0.096	0.075	0.220
73/07/15	08 55		0.910	0.960	0.028	0.046	0.170
73/08/19	09 05		1.140	1.150	0.118	0.044	0.180
73/09/16	09 00		0.590	1.100	0.072	0.042	0.260
73/10/21	09 30		2.200	1.550	0.336	0.072	0.375
73/11/11	09 30		2.400	0.300	0.080	0.056	0.130
73/12/02	08 20		5.400	0.100K	0.076	0.052	0.115
74/01/06	09 20		4.700	0.800	0.132	0.080	0.140
74/02/17	09 15		4.200	0.700	0.155	0.115	0.195
74/03/03	09 55		5.000	0.800	0.055	0.055	0.200
74/03/10	10 00		2.600	2.600	0.120	0.105	0.660
74/03/31	08 45		3.700	1.600	0.145	0.095	0.260
74/04/21	08 50		2.940	0.900	0.045	0.035	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/10

3401H1
40 43 16.0 081 35 20.0
ELM RUN
39 7.5 NAVARRE
T/BEACH CITY RESERVOIR
HWY BRDG E SIDE OF NORTH BREWSTER
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	10 00		2.200	0.440	0.036	0.007	0.020
73/06/10	09 20		2.300	0.640	0.073	0.012	0.035
73/07/15	09 10		1.680	0.910	0.048	0.019	0.045
73/08/19	09 25		0.960	1.540	0.078	0.015	0.040
73/09/16	09 25		0.940	0.880	0.098	0.009	0.050
73/10/21	09 50		0.620	1.200	0.088	0.018	
73/11/11	09 35		1.060	0.950	0.108	0.020	0.025
73/12/02	08 35		3.080	0.800	0.072	0.012	0.055
74/01/06	09 50		2.760	0.100K	0.040	0.008	0.035
74/02/17	09 25		3.200	0.400	0.040	0.005	0.025
74/03/03	10 05		2.200	0.600	0.015	0.010	0.060
74/03/10	10 15		2.100	1.300	0.035	0.040	0.300
74/03/31	08 55		2.200	0.800	0.035	0.020	0.085
74/04/21	09 05		2.200	0.400	0.030	0.005	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

3901C1
40 43 00.0 081 39 50.0
NORTH FORK
39 7.5 WILMOT
T/BEACH CITY RESERVOIR
2NDRY RD BRDG .5 MI S OF WEST LEBANON
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	09	10	2.100	0.750	0.060	0.036	0.055
73/06/10	08	55	2.200	0.560	0.058	0.054	0.095
73/07/15	08	45	0.580	1.570	0.115	0.052	0.155
73/08/19	08	55	0.420	0.560	0.048	0.056	0.100
73/09/16	08	55	0.460	0.440	0.079	0.083	0.152
73/10/21	09	25	0.620	0.800	0.046	0.097	0.315
73/11/11	09	10	1.260	0.650	0.048	0.176	0.340
73/12/02	08	10	3.800	0.200	0.064	0.060	0.115
74/01/06	09	00	3.200	0.600	0.072	0.088	0.140
74/02/17	09	05	2.940	0.300	0.025	0.095	0.150
74/03/03			3.600	0.700	0.040	0.035	0.115
74/03/10	09	50	3.200	1.700	0.040	0.060	0.395
74/03/31	08	30	3.000	0.800	0.045	0.040	0.150
74/04/21	08	45	1.680	0.100K	0.020	0.025	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

390101
40 40 44.0 081 47 20.0
MIDDLE FK SUGAR CREEK
39 7.5 NAVARRE
T/BEACH CITY RESERVOIR
STONEFORD ST BRDG 1.5 MI NE OF WILMOT
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	10	20	1.840	1.380	0.061	0.010	0.030
73/06/10	09	30	1.400	0.690	0.138	0.019	0.100
73/07/15	09	20	0.820	1.500	0.115	0.028	0.135
73/08/19	09	40	0.600	0.840	0.072	0.026	0.140
73/09/16	09	45	0.340	1.320	0.115	0.027	0.135
73/10/21	10	05	0.730	0.450	0.040	0.019	0.220
73/11/11	09	45	1.180	0.650	0.084	0.020	0.030
73/12/02	08	50	3.600	0.300	0.060	0.012	0.065
74/01/06	09	50	2.940	0.400	0.068	0.012	0.025
74/02/17	09	45	2.700	0.300	0.035	0.010	0.025
74/03/03	10	25	3.080	0.600	0.030	0.030	0.135
74/03/10	10	30	2.700	1.700	0.065	0.020	0.330
74/03/31	09	05	2.900	1.012	0.065	0.020	0.285
74/04/21	09	15	1.440	1.100	0.065	0.010	0.040

STORET RETRIEVAL DATE 75/02/10

3901E1
40 38 08.0 081 35 13.0
UNNAMED STREAM
39 7.5 NAVARRE
T/BEACH CITY RESERVOIR
2NDRY RD BRDG 1 MI S OF BEACH CITY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	11 00		1.260	0.960	0.115	0.005K	0.010
73/06/10	10 00		0.960	1.000	0.176	0.005K	0.010
73/07/15	09 45		0.630	1.980	0.280	0.010	0.012
73/08/19	10 10		0.460	0.605	0.220	0.006	0.010
73/09/16	10 10		0.176	0.660	0.510	0.014	0.020
73/10/21	10 35		0.950	0.700	0.170	0.008	
73/11/11	10 10		1.260	0.350	0.156	0.008	0.050
73/12/02	09 40		2.500	0.100	0.072	0.005K	0.035
74/01/06	10 45		1.900	0.400	0.128	0.005K	0.065
74/02/17	10 35		1.680	0.300	0.105	0.005K	0.025
74/03/03	10 40		1.930	0.400	0.060	0.005K	0.055
74/03/10	11 15		1.900	0.600	0.060	0.005K	0.065
74/03/31	09 50		2.200	0.500		0.005K	0.035
74/04/21	10 00		1.200	0.600	0.190	0.005K	0.025

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

3901F1
40 35 55.0 081 39 40.0
INDIAN TRAIL CREEK
39 7.5 SUGAR CREEK
T/BEACH CITY RESERVOIR
2NDRY RD BRDG 2 MI SE OF WINESBURG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	11 30		1.700	1.320	0.077	0.007	0.015
73/06/10	10 20		0.900	1.050	0.079	0.012	0.050
73/07/15	10 05		0.600	1.680	0.064	0.024	0.090
73/08/19			0.550	0.710	0.065	0.058	0.135
73/09/16	10 30		0.740	1.180	0.198	0.063	0.180
73/10/21	10 50		1.140	2.100	0.210	0.050	0.360
73/11/11	11 20		1.260	0.925	0.232	0.028	0.097
73/12/02	10 05		3.300	0.400	0.108	0.008	0.055
74/01/06	11 00		2.605	0.500	0.168	0.008	0.045
74/02/17	10 55		2.200	0.500	0.160	0.005	0.040
74/03/03	11 35		2.500	0.800	0.155	0.010	0.085
74/03/10	11 55		2.300	1.100	0.230	0.010	0.090
74/03/31	10 20		2.760	0.800	0.145	0.015	0.130
74/04/21	10 15		1.180	0.600	0.042	0.005	0.025

STORET RETRIEVAL DATE 75/02/10

390161
40 32 10.0 081 41 45.0
GOOSE CREEK
39 7.5 SUGAR CREEK
T/BEACH CITY RESERVOIR
2NDRY RD BRDG 1.3 MI ENE OF WALNUT CRK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	12 55		2.500	0.980	0.054	0.027	0.070
73/06/10	11 45		1.760	0.770	0.084	0.022	0.060
73/07/15	11 30		0.780	1.600	0.168	0.027	0.085
73/08/19			0.670	0.960	0.154	0.044	0.130
73/09/16	12 30		0.190	7.200	1.000	0.345	0.900
73/10/21	12 10		0.450	2.200	0.640	0.023	
73/11/11	12 55		0.900	1.500	0.320	0.024	0.095
73/12/02	11 10		4.620	0.200	0.124	0.024	0.075
74/01/06	12 10		4.000	0.500	0.132	0.024	0.060
74/02/17	12 25		3.520	0.400	0.065	0.015	0.060
74/03/03	12 05		3.900	0.600	0.070	0.032	0.095
74/03/10	13 00		3.700	0.500	0.050	0.030	0.090
74/03/31	12 00		4.500	0.700	0.065	0.035	0.130
74/04/21	11 20		1.900	0.500	0.030	0.030	0.040

STORET RETRIEVAL DATE 75/02/10

3901H1
40 32 15.0 081 42 00.0
#ALNUT CREEK
39 7.5 SUGAR CREEK
T/BEACH CITY RESERVOIR
2NDRY RD BRDG 1 MI ESE OF WALNUT CREEK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	12 40		2.200	1.000	0.056	0.022	0.050
73/06/10	11 40		1.820	1.300	0.093	0.034	0.180
73/07/15	11 25		0.740	3.100	0.138	0.050	0.145
73/08/19			0.900	1.900	0.150	0.042	0.140
73/09/16	12 20		1.160	1.400	0.350	0.039	0.120
73/10/21	12 05		0.820	1.700	0.400	0.036	
73/11/11	12 45		1.340	1.200	0.276	0.092	0.250
73/12/02	11 00		3.600	0.600	0.080	0.028	0.100
74/01/06	12 05		3.100	0.600	0.096	0.028	0.100
74/02/17	12 20		2.900	0.500	0.090	0.025	0.070
74/03/03	12 00		2.730	0.700	0.070	0.030	0.120
74/03/10	12 50		2.640	0.800	0.040	0.020	0.155
74/03/31	11 45		3.000	0.700	0.055	0.015	0.115
74/04/21	11 30		2.100	0.600	0.040	0.020	0.030

STORET RETRIEVAL DATE 75/02/03

3901J1
40 31 00.0 081 37 30.0
S FK SUGAR CREEK
39 7.5 STRASBURG
T/BEACH CITY RESERVOIR
2NDRY RD BRDG .5 MI NE OF SUGAR CREEK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	12 00		3.000	1.950	0.250	0.005K	0.120
73/06/10	10 55		3.200	2.200	0.273	0.014	0.220
73/07/15	10 30		0.950	3.100	0.550	0.890	1.150
73/08/19			1.540	1.280	0.440	1.100	1.570
73/09/16	11 00		0.640	2.100	1.470	0.140	0.520
73/10/21	11 20		0.890	1.950	0.855	0.023	0.320
73/11/11	11 45		1.260	1.600	0.690	0.024	0.440
73/12/02	10 30		4.620	0.400	0.156	0.020	0.230
74/01/06	11 30		3.700	0.800	0.240	0.132	0.550
74/02/17	11 15		3.520	0.900	0.270	0.075	0.590
74/03/03	11 35		3.780	1.000	0.135	0.010	0.250
74/03/10	11 55		3.900	1.300	0.125	0.080	0.510
74/03/31	10 40		4.200	1.000	0.100	0.010	0.280
74/04/21	10 50		2.760	0.600	0.200	0.005K	0.085

K VALUE KNOWN TO BE
LESS THAN INDICATED

-134-

STORET RETRIEVAL DATE 75/02/03

3901K1
40 30 30.0 081 36 45.0
E BRANCH
39 7.5 STRASBURG
T/BEACH CITY RESERVOIR
ST RT 39 BRDG 1 MI E OF SUGAR CREEK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/06	12 20		2.300	0.850	0.110	0.005K	0.063
73/06/10	11 00		2.500	0.800	0.130	0.005K	0.130
73/07/15	10 35		0.770	1.760	0.378	0.006	0.155
73/08/19			1.220	1.100	0.215	0.019	0.220
73/09/16	11 10		0.490	1.680	0.470	0.005K	0.420
73/10/21	11 25		0.510	1.500	0.400	0.007	0.375
73/11/11	11 55		1.260	1.050	0.250	0.008	0.260
73/12/02	10 40		4.300	0.100K	0.088	0.005K	0.140
74/01/06	11 45		3.100	0.600	0.124	0.005K	0.100
74/02/17	11 20		2.700	0.600	0.105	0.005K	0.100
74/03/03	11 40		3.700	0.900	0.075	0.005	0.190
74/03/10	12 05		3.600	1.500	0.075	0.010	0.315
74/03/31	10 45		4.100	0.800	0.085	0.005K	0.230
74/04/21	10 40		1.760	0.700	0.080	0.005K	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED